REMARKS

Favorable reconsideration and allowance of the claims of the present application, as amended herein, are respectfully requested.

In the present Office Action, the drawings have been objected to under 37 C.F.R. § 1.83(a) for allegedly not showing every feature recited in Claim 1 of the present application.

In response thereto, applicants have amended Claim 1 to positively recite that a structure having an upper surface and comprising at least a second substrate having a surface roughness in the range from about 0.3 nm to about 1 nm RMS and an intermediate agent layer is selected and the upper surface of the structure is bonded to the first substrate. Applicants submit that since the above amendment to Claim 1 obviates the Examiner's objection to the drawings reconsideration and withdrawal thereof, without any drawing corrections, are respectfully requested.

In addition to the drawing objections, the specification has been objected to due to the informalities mentioned on Page 3 (item 4) of the instant Office Action. In response thereto, applicants have amended the specification in the manners proposed by the Examiner in the Office Action, with one exception being that no amendment to Page 4, line 21 was made since applicants' copy includes the correct spelling of the term "remaining". In the event that the Examiner's copy has the incorrect spelling of the term "remaining" authorization is hereby given to the Examiner to correct the spelling via an Examiner's amendment.

Applicants submit that the above amendments to the specification obviate the Examiner's objection to the instant disclosure. Therefore, applicants respectfully request reconsideration and withdrawal thereof.

Claims 1, 6, 19 and 21 are rejected under 35 U.S.C. § 112, second paragraph, as allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In response thereto, applicants have amended Claims 1, 6, 19 and 21 in a manner in which the indefiniteness rejections noted in the present Office Action have been obviated. Hence, in view of the above amendments to Claims 1, 6, 19 and 21, applicants respectfully request reconsideration and withdrawal of the indefiniteness rejection.

Claims 1, 9, 10, 19 and 20 stand rejected under 35 U.S.C. § 103 as allegedly unpatentable over the combined disclosures of U.S. Patent No. 6,521,041 to Wu, et al. ("Wu, et al.") and U.S. Patent No. 6,328,796 to Kub, et al. ("Kub '796"). Claim 6 stands rejected under 35 U.S.C. § 103 as allegedly unpatentable over the combined disclosures of Wu, et al., Kub '796 and U.S. Patent No. 5,906,951 to Chu, et al. ("Chu, et al."). Claims 1, 9, 10, 19 and 21-23 stand rejected under 35 U.S.C. § 103 as allegedly unpatentable over the combined disclosures of U.S. Patent No. 6,573,126 to Cheng, et al. and Kub '796 and U.S. Patent No. 6,153,495 to Kub, et al. ("Kub '495").

Applicants submit that the combinations of applied references that utilize Wu, et al. as the principal reference do not render applicants' claimed method obvious since none of the applied references teaches or suggests the various processing steps claimed. Specifically, the applied references do not teach or suggest a method which includes the steps of forming a graded $Si_{1-x}Ge_x$ epitaxial layer on a first single crystalline semiconductor substrate, forming a relaxed $Si_{1-y}Ge_y$ epitaxial layer over said graded $Si_{1-x}Ge_x$ layer, smoothing the surface of said relaxed $Si_{1-y}Ge_y$ epitaxial layer to provide a surface roughness in the range from about 0.3 nm to about 1 nm root mean square (RMS), ***selecting a structure having an upper surface and comprising a***

second substrate having a surface roughness in the range from about 0.3 nm to about 1 nm RMS and an intermediate agent layer selected from the group consisting of Al, W, Co and Ti, and bonding said smoothed surface of said relaxed $Si_{1-y}Ge_y$ epitaxial layer on said first substrate to the upper surface of said structure including said second substrate, ***said step of bonding including the step of annealing to form sufficiently strong bonds across the bonding interface to form a single mechanical structure, whereby during said bonding said intermediate agent layer forms a metal silicide***. Hence, in the present invention, a metal silicide forms in-situ during the bonding step.

Wu, et al. describe a method in FIG. 10 in which a first structure including a Si substrate 1002, a $SiGe_{1-x}Ge_x$ graded layer, and a $SiGe_{1-y}Ge_y$ uniform layer is formed. A second structure including Si substrate 1010 and SiO_2 layer 1012 is provided and thereafter the uniform SiGe layer is bonded to the SiO_2 layer of the second substrate by annealing. Wu, et al. do not teach or suggest that the second structure includes an intermediate agent layer comprising one of the metals recited in Claim 1 and that upon annealing the metal reacts with Si to form a silicide.

The above defects in Wu, et al. are not alleviated by Kub '796 since the secondary reference does not teach or suggest the claimed method recited in amended Claim 1. In particular, Kub '796 does not teach or suggest that upon bonding the intermediate agent layer is converted into a silicide. Kub '796 does mention that a metal or a silicide layer may be present at the bonding interface, but there are no details in the patent as to how the layer is formed.

Chu, et al., which provide a method for forming strained layers on an insulator comprising the steps of: selecting a first semiconductor substrate, forming a first epitaxial graded layer of $Si_{1-y}Ge_y$ over said first semiconductor substrate where y at its upper surface is in the range from 0.2 to 0.5, forming a second relaxed layer of SiGe, forming a third p++ doped layer of SiGe, forming a fourth epitaxial strained layer selected from the group consisting of Si and

SiGe, forming a fifth relaxed $Si_{1-x}Ge_x$ layer where x is in the range from 0.2 to 0.5, forming a sixth layer of Si, selecting a second substrate having an upper layer selected from the group consisting of Si and SiO_2 thereon, bonding the upper surface of said sixth layer and said second substrate together, and removing said first substrate and said first and second layers, do not teach or suggest the claimed method recited in amended Claim 1. In particular, Chu, et al. do not teach or suggest that upon bonding an intermediate agent layer is converted into a silicide. Indeed, applicants find no reference to the term silicide in the Chu, et al. disclosure.

Based upon the above amendments and remarks, the obviousness rejections based on Wu, et al., and Kub '976 or Wu, et al., Kub '976 and Chu, et al. have been obviated. Reconsideration and withdrawal thereof are respectfully requested.

Applicants submit that the combinations of applied references that utilize Cheng, et al. as the principal reference do not render applicants' claimed method obvious since none of the applied references teaches or suggests the various processing steps claimed. Specifically, the applied references do not teach or suggest a method which includes the steps of forming a graded $Si_{1-x}Ge_x$ epitaxial layer on a first single crystalline semiconductor substrate, forming a relaxed $Si_{1-y}Ge_y$ epitaxial layer over said graded $Si_{1-x}Ge_x$ layer, smoothing the surface of said relaxed $Si_{1-y}Ge_y$ epitaxial layer to provide a surface roughness in the range from about 0.3 nm to about 1 nm root mean square (RMS), ***selecting a structure having an upper surface and comprising a second substrate having a surface roughness in the range from about 0.3 nm to about 1 nm RMS and an intermediate agent layer selected from the group consisting of Al, W, Co and Ti,*** and bonding said smoothed surface of said relaxed $Si_{1-y}Ge_y$ epitaxial layer on said first substrate to the upper surface of said structure including said second substrate, ***said step of bonding including the step of annealing to form sufficiently strong bonds across the bonding interface***

to form a single mechanical structure, whereby during said bonding said intermediate agent layer forms a metal silicide. Hence, in the present invention, a metal silicide forms in-situ during the bonding step.

Cheng, et al. provide a method for producing monocrystalline semiconductor layers. In an exemplary embodiment, a graded Si_{1-x} Ge_x (x increases from 0 to y) is deposited on a first silicon substrate, followed by deposition of a relaxed Si_{1-y} Ge_y layer, a thin strained Si_{1-z} Ge_z layer and another relaxed Si_{1-y} Ge_y layer. Hydrogen ions are then introduced into the strained Si_{1-z} Ge_z layer. The relaxed Si_{1-y} Ge_y layer is bonded to a second oxidized substrate. An annealing treatment splits the bonded pair at the strained Si layer, whereby the second relaxed Si_{1-y} Ge_y layer remains on said second substrate. In another exemplary embodiment, a graded $Si_{1-x}Ge_x$ is deposited on a first silicon substrate, where the Ge concentration x is increased from 0 to 1. Then, a relaxed GaAs layer is deposited on the relaxed Ge buffer. As the lattice constant of GaAs is close to that of Ge, GaAs has high quality with limited dislocation defects. Hydrogen ions are introduced into the relaxed GaAs layer at the selected depth. The relaxed GaAs layer is bonded to a second oxidized substrate. An annealing treatment splits the bonded pair at the hydrogen ion rich layer, whereby the upper portion of relaxed GaAs layer remains on said second substrate.

Applicants respectfully submit that Cheng, et al. do not teach or suggest a method in which a structure including a second substrate and an intermediate agent layer is used and that upon bonding the intermediate agent layer forms a silicide. Applicants observe that the term "silicide" does not appear in the disclosure of Cheng, et al.

The above defects in Cheng, et al. are not alleviated by Kub '796 since the applied secondary reference does not teach or suggest the claimed method recited in amended Claim 1.

In particular, Kub '796 does not teach or suggest that upon bonding the intermediate agent layer is converted into a silicide. Kub '796 does mention that a metal or a silicide layer may be present at the bonding interface, but there are no details in patent as to how the layer is formed.

The above defects in Cheng, et al. are not alleviated by Kub '495 since the applied secondary reference does not teach or suggest the claimed method recited in amended Claim 1. In particular, Kub '495 does not teach or suggest that upon bonding the intermediate agent layer is converted into a silicide. Kub '495 does mention a silicide layer 123 may be present at the bonding interface (see FIG 13), but the silicide is formed prior to bonding, not during bonding, as presently claimed.

Based upon the above amendments and remarks, the obviousness rejections based on Cheng, et al., and Kub '976 or Cheng, et al., Kub '976 and Kub '495 have been obviated. Reconsideration and withdrawal thereof are respectfully requested.

Thus, in view of the foregoing amendments and remarks, it is firmly believed that the present case is in condition for allowance, which action is earnestly solicited.

Respectfully submitted,

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